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ABSTRACT

This research discuss the initial efforts to investigate ergonomic in interior design of living room in the residential buildings in Hodaidah city using an anthropometric database for Hodaidah population as a guide and reference on designing the living room furniture; these furniture were examined for comfort, beside that in order to reduce the rate of physical problem of the living room users, development of living room interior design using anthropometry database for Hodaidah Population was carried out. Where ever dimensions of the used spaces, buildings, and any kind of material and different riggings designed for the users, anthropometric measurements were used. The first provision in system designing from ergonomic respect is the measures of the human who uses the system and who takes part in that system. Because of this, anthropometric measures are the most important ergonomic data during the redesigning processes.

The problem statement and objectives of the research have been identified. Besides that, scope, importance of the study along with the online of the study

have been reviewed and discussed. For the literature review information in reference books and internet, and from journal for histories were collected. To gather the data for anthropometric data base, surveys have been conducted and published on various populations, especially to residents building in Hodaidah. In this research, according to the anthropometric data the results of the research carried out on the data collection by 21 part body and also it is presented. At the same time, in this research various dimensions of furniture used by Hodaidah Population' in living room were measured so that compare with existing furniture dimensions and optimum furniture dimensions based on the anthropometric datum. As a result, furniture used in living rooms were designed according to the anthropometric measures of the users. Then, the collected data were transferred to coding sheet, tabulated, analyzed, statistically treated to redesign living room furniture to get the result. The statistical variables such as percentiles, mean and standard deviation were used to present and describe the data.

Hence a research was undertaken to study the interior design of living room in the residential building in Hodaidah city situated in Yemen; 40 resident's buildings were selected purposively from each of the three districts (Al Hali, Al Hawak and Al Mina) of the city which were developed in different time periods.

Justification of the study

Research justification refers to the rationale for the research, or the reason why the research is being conducted, including an explanation for the design and methods employed in the research. Traditionally in research conducted within any paradigm, researchers have been expected to provide an explanation about why the research is necessary. To explain the overall purpose, aims, and objectives, a rationale is constructed and may illustrate how the research endeavor addresses gaps in the existing knowledge base, contributes a new dimension or perspective, or generates theory about a phenomenon that has not been explored previously. Another aspect of research for which one might sometimes find justification in any description is the choice of methods employed to

generate data; for example, the explanation for selecting interviews, focus groups, or participant observation (Given .Lisa 2008).

A number of studies have been conducted in India and Abroad regarding the designing of the living room areas to increase the efficiency of the Interior Design. But there is not a single study carried out at Yemen pertaining to the designing of living room space and to increase their efficiency and to make the users of living room comfortable with the improved design. Hence present study is planned to redesign living room space and furniture based on the concept of ergonomics which will teach them efficient use of equipment, furniture and living room space.

The present study is just a step forward to the contribution in preservation of various aspects of interiors of residential buildings and identifying the style of construction and decorations used in the houses. With this background the present study was undertaken.

1.6 Purpose and Scope.

The purpose of developing these guidelines is to help develop the residential buildings in Hodaidah city zones with their special character and to redesign living room furniture and the living space for people who used the living room. However this study provides general guidance and outlines technical requirements that apply to living room in residential building related and furniture related ergonomic and interior design projects, new construction and renovation projects. The information provided through this living room in building will be used by interior designers, ergonomists and will serve as the guide line for minimum interior design requirements.

Excellence in design is the primary goal for all projects. Reaching this goal requires a commitment by the data collection and redesign living room ergonomically to a level of quality that includes the coordinated relationship of interior design with the space area design, as well as the details of design that affect the users of the facilities. Quality interior

design is value addition to a project as it vitally improves facility operating efficiency, attractiveness, livability, life-cycle economics, and most importantly, the productivity of the users.

Home is the most important place in the world. After all, it's the one space where one can live completely the way one wants; 24 hours a day, 7 days a week. The living room is generally seen as an important place to use. Compared to other rooms, there are relatively few serious accidents in room (Kumar, 2006). The hazards one faces are different.

The major health risks in this room do not arise from immediate, potentially fatal hazards. Instead, the risks that user face comes from more subtle hazards whose effect accumulates over time. Research shows that furniture operators face a substantially higher risk of muscle pain and injury than user in other room. Studies also show that the frequency of persistent neck and shoulder injuries increases with years of user. One report found that furniture operators experience as many cases of repetitive strain injuries as important place in house.

These injuries lead to long-term health effects. This is why researcher wanted to look at the working conditions that can lead to such high rates of disability for living room user. That's why the researcher has packed the study with lots of ideas on how one can make space more flexible, comfortable and functional to make space more meaningful. Research has consistently found that the physical characteristics of the work are an important risk factor for muscle pain and injury. The risks of poor living room design, furniture, organizational factors, repetition, force, posture and vibration are associated with higher rates of injury. But one can't look at the living room area alone to understand these injuries.

Few studies, however, have investigated physical and organizational risk factors at the same time in more than one living room space and most studies have focused only on furniture arrangement, (Gunning 2001).

The purpose of this study was to document and describe the current work conditions throughout the living room. Residential interior space designing

is a creative art which can transform an ordinary house into a very happy lively home. The purpose of interior designing is to make the home livable according to the needs and requirement of the family and the space characteristics.

The interior designing should be able to satisfy the functionalism, expressiveness and beauty. It is not the decorating of the house. But it is the total designing of the house. It gives scope that the designing should be such that it should be able to express the personality, aesthetic taste of the family living in, through proper designing of the space, proper selection of furniture pieces, accessories and furnishing.

The primary research question guiding this study and the subsequent design solution is: What is an appropriate design solution for living room space that is conducive to residents in residential building at Hodaidah city who use living room space.

To answer this primary question, the researcher will also seek to answer the following questions:

- 1) How can design elements of ergonomics and ergonomic comfort integrates to create living room space that is conducive to residents in residential building at Hodaidah city What is an appropriate balance of furniture arrangement and living room spaces needed for house residences?
- 2) How can living room spaces be designed for house residences to arrange furniture in living room space?
- 3) What other features should be included in the living room design to make the workplace more comfortable to residents in residential building at Hodaidah city.

Research aims.

Objectives:

The study aimed at design responsibility of living room in the residential buildings in Hodaidah city according to the requirements of the users or the people who would be living in them.

However design aims to facilitate the fulfillment of special needs and life objectives of users into their environments. In fact, “good design directly impacts the quality of life” (Brawley, 2001). With this objective the present study was set as follows:

a) General Objective:

The primary goal of this study is to develop criteria for designing living room space that accommodates aging house residents and to redesign living room that is shared by them, considering their measurement of human body dimensions. Based on environment and Ergonomic Investigation in the Interior Design of living room in the residential buildings of Hodaidah city, based upon research, observations and interviews of residents in residential building at Hodaidah city improvements would be planned and suggestions to the occupants would be given for safe living.

b) Specific Objectives:

The aims of the present study were as follows:

- 1) To study the anthropometric measurements of residents of Hodaidah city.
- 2) To Study existing living room Interior Design of selected residential buildings in Hodaidah city.
- 3) To identify issues and problems associated with space and furniture activities.
- 4) To use assessment information in order to redesign living room furniture for people how used the living room.
- 5) To ascertain physiological and subjective feeling (using Borg scale) of the residents in living room using a conventional design and suggest newly designed furniture and interior space design which is ergonomically suitable to the residents.

- 6) To create a prototype of living room space that is well designed and allows residents in residential building at Hodaidah city who used the living room space to enhance ergonomics comfort.

Limitations of the study

In this study, only living room in residential building at Hodaidah city and the residents participated in the research and data collection. This study mainly focuses on the physiological and perceived exertion of the Hodaidah city population. The postural angles were not measured using Goniometry due to unavailability of the equipment. Since the research was conducted within sample in the Hodaidah city, it is possible that external situations prevalent in other geographical areas may produce different findings from those presented.

The anthropometric data base created for the study and the new living room design developed would be applicable to population of the Hodaidah city only.

Delimitations of the study

1. The study was limited to the population of the Hodaidah city.
2. The study was limited to only living room interior re designing of the selected population.
3. The study was limited to ten selected house hold of Hodaidah city for redesigning the selected households

Methodology

3.2 Variables of the study.

A variable is any characteristic that varies across people or situations that can be of different levels or types, the variables selected for the present study along with the rational for selecting; these Variables have been presented as follows:

a) Independent variable:

Age of the selected respondents

From birth to old age the changes reported are significant that may be accounted for most of the engineering situations (A Damon -1971).One needs to consider age before assessing discomfort of the furniture and before redesigning new furniture.

Activities carried out in living room.

b) Dependent variable:

Body discomfort experienced by living room users

3.3 Conceptual framework

A Conceptual framework provides a "cognitive map", or set of interrelated concepts for understanding a process (Boone, 2002).

a) Conceptual framework for descriptive study:

To get clearer and deeper understanding of the way in which interior design of living room operation causes discomfort to the Hodaidah city respondent, an attempt was made to identify various possible variables which have their contribution in rendering this operation arduous and drudgery.

Guided by available literature and related researches, the variables were organized to develop a conceptual framework. The schematic representation of the various factors which were thought to be contributive in ergonomic investigation in the Interior Design of living room in the residential buildings in Hodaidah city.

b) Conceptual framework for study:

The study conceptualized that impact of the use of traditional furniture to the users of living rooms of selected house hold in Hodaidah city .The ergonomic assessment was done in terms of physiological cost, body discomfort experienced, and human dimensions relation to the anthropometric characteristic of the residents in living room, on the

basis of anthropometric measurements the rooms were re designed to increase comfort of the users.

The design process in living room has four major components: construction, form giving, shaping, major aesthetics, and ergonomics (including anthropometry).

3.4 Operational definitions:

- **Small children:** Male /Female children between the ages of 3 years to 10 years are operationally defined as small children.
- **Adolescent:** Male /Female children between the ages of 11 years to 17 years are operationally defined as adolescent.
- **Adult:** Male /Female individual between the ages of 18 years to 40 years are operationally defined as adult.
- **Older groups:** Male /Female individual between the ages of 41 years to 65 years are operationally defined as older groups.
- **Body discomfort:** It is defined as the pain arising as a result physical problems experienced by users of the living room because of the living room furniture that does not fit with anthropometric measurements.

Sampling design

Sample and sample size:

A multistage purposive cum random sampling was done to select sample of the study. Stratified weighted random sampling was used for drawing sample for general survey and purposive sampling was used for study group. The sample for survey was selected from Hodaidah city population about 416136 inhabitants (Population, 2004). One percent of the total population (416) population was selected for anthropometric measurements and survey. Out of 416 houses holds 40 houses and their living rooms were studied for furniture arrangements and the problems faced by the occupants.

Validation: The interview schedule for survey was validated for correctness and content by giving it to the experts from different institution such as NIOH(National Institutes Of Occupational Health) Ahmedabad ,Department of

family and community Sciences, M.S. University ,Home Science College, Vallabh Vidya nagar .According to the suggestions of the expert changes were incorporated to finalize the tool .

3.5 Analysis of data

The data collected through survey were categorized, coded, and then tabulated.

In this study, the users of living room in residential buildings at Hodaidah city contributed and answered a research questionnaire and their living room were redesigned.

The coding of the raw data was carried out using SPSS (statistical Package for social sciences).It was done to convert raw data into categories for meaningful analysis of the surveyed data.

For the present study, the data were categorized in the following manner:

Age (in completed years): It was categorized into four exclusive categories with equal intervals.

- Age 3 to 10 years (Female and Male) small children
- Age 11 to 17 years (Female and Male) adolescent.
- Age 18 to 40 years (Female and Male) adults.
- Age 41 to 65 years (Female and Male) older group

Activities carried out in living room.

The activities carried out in living room in Hodaidah city were as follows:

- ❖ Watching TV.
- ❖ Conversation between family members.
- ❖ Eat snacks.
- ❖ Children's play.
- ❖ Reading newspapers, magazines and books.

To redesign the living room interior and furniture design, data from Hodaidah city population are needed. However, not all relevant variables for all Republic of Yemen are available. The data of respondents were used (specified above). No data were found for countries with populations with smaller body heights, such as Portugal and Spain. The anthropometric monument of one percent population was treated using descriptive statistics and 5th, 50th and 95th percentiles were calculated with mean and SD to create anthropometric data base of Hodaidah city and was used for redesigning the interior.

For experimental work 10 house were be selected purposively for interior design detailed study.

Salient finding

Anthropometric measurement of selected population of Hodaidah city.

Anthropometric measurements of respondents were estimated in mm, except for body weight which is given in KG. Anthropometric measurements of total 416 people including children, female and male between age of 3 years to 6 years, 7 years to 10 years, 11 years to 13 years, 14 years to 17 years, 18 years to 40 years and 41 years to 65 years, were taken which comprised of one percent of total population. 5th, 50th, 95th were calculated with mean and standard deviation all selected body measurements to generate data bank for Hodaiah city population

Activities carried out in living room.

In majority of the selected house hold entertainment, conversation, receiving guests, at time eating together are the major activities. For sitting purpose generally low sitting arrangement with cushion was used. Use of accessories was limited to center table with flower pot, picture, curtains and carpets.

Because of the traditional sitting arrangement without ergonomic consecration was inconvenient to the users , maximum percentage(50%) sat on sofa relaxing backwards. maximum percentage (55%) had low seat height of sofa

which was not comfortable to them. maximum percentage (5%) felt the slope of the back rest was too much forward maximum percentage (57%) felt that the length of the back too long. the respondents had workstation where the design was causing awkward posture. 75,72and 62 percent of the respondents did not have arm rest provision, clear visibility for task performance and adequate program for maintenance of tools and equipment respectively.

80 percent of respondents had suffered pain or discomfort with living room furniture. Maximum percentage (47%) felt the pressure on thighs, majority (62.5%)of the respondents suffered pain on neck while sitting on sofa. maximum percentage (37.5%) of the respondents who were elderly suffered from pain years ago, (42.5%) of the respondents had unbearable pain and had taken medical treatment. maximum percentage (87.5 %) of the respondents suffered pain on lower back.

On the basis of the discomfort and pain in the body the researcher re designed the living room of selected house hold in Hodeida city keeping in mind principles of furniture arrangement, anthropometric measurements of the people and habits of the people.

Conclusion of the study

From above all it can be concluded that ergonomically designed living room are safer and better. The manufacturers and designers must use it in a proper way so that even low cost furniture fulfills basic ergonomic requirements.

The customers are generally unaware of the ergonomic laws. It is the responsibility of the furniture makers and designers to redesign the furniture that will save human energy while they are living in home environment. Many of the items included in this reference can help engineers, designers, and others create products and spaces that will

be more ergonomic for the user and increase user comfort. Others can use this tool for general information and guidelines on ergonomics and design.

Recommendations for further studies.

The present study deals with interior design of residences of Hodaidah city. As this is maiden effort to study interior design and consider it ergonomically to improve and redesign the living room the researcher wishes to throw light on some of the untouched aspects so that further studies could be carried out

1. The study could be extended to all the rooms of the house and could be studied in detail.
2. Study of different styles of interior design for the city of Hadeidah, according to the different areas in the province of Hodaidah could be carried out.
3. The **further studies** need to be expanded to the anthropometric measurement of Yemen population and the problems of design for Yemen in general.
4. A comparative study of problem with living room furniture design can be carried out among different income group residents from Hodaidah city.
5. A comparative study of problems with living room furniture design between Indian and Yemen population could be carried out.